

SHRI MATA VAISHNO DEVI UNIVERSITY, KATRA
School of Mechanical Engineering
B. Tech. Major Examination (Odd) 2019-20

Entry No:

Date: 12/12/2019

Total Number of Pages: [1]

Total Number of Questions: [5]

Course Title: Fluid Mechanics

Course Code: MEL-2231

Time Allowed: 3.0 Hours

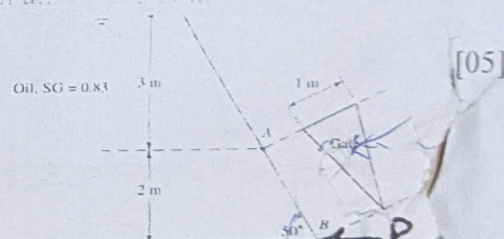
Max Marks: [50]

Instructions / NOTE

- i. Attempt All Questions.
- ii. Assume an appropriate data / information, wherever necessary / missing.

Q1. a) What is surface tension? What is its cause? Why the surface tension is also called as surface energy. A spherical water drop of 1 mm in diameter splits up in air in to 64 smaller drops of equal size. Find the work required in splitting up the drop. The surface tension coefficient of water in air = 0.073 N/m [05]

b) Isosceles triangle gate AB in Fig. shown below is hinged at A and weighs 1500 N. What horizontal force P is required at point B for equilibrium?



Q2. a) What is the Lagrangian description of fluid motion? Is the Lagrangian method of fluid flow analysis more similar to study of a system or a control volume? Discuss [05]

b) What is velocity potential? Give its significance. If, for a 2 D potential flow, the velocity potential is given by $\phi = 4x(3y-4)$, determine the velocity at point (2, 3). Determine also the value of stream function Ψ at point (2, 3). [05]

Q3. State and prove Bernoulli's equation. A venturimeter is fitted to a horizontal pipe of 0.15 m diameter with flow rate of $240 \text{ m}^3/\text{hr}$. The pressure head at the inlet for this flow is 18 m above atmospheric and the pressure head at the throat is 7 m below atmospheric. Between the inlet and the throat there is an estimated frictional loss of 10 % of the difference in pressure head between these points. Calculate the minimum allowable diameter for the throat. [10]

Q4. a) What are orifices and mouthpieces? Prove that the discharge through an external cylindrical mouth piece is more than that of an orifice. [05]

b) What is Reynold's number? How it is used to differentiate between laminar and turbulent flows. What is the significance of hydraulic diameter? How is the friction coefficient dependent on Reynolds number? [05]

Q5. a) Discuss the effect of flow losses in pipes. Derive an expression to calculate the major losses in the flow through the pipes. [05]

b) What is the mechanism of flow separation? Discuss the head losses due to sudden contraction and sudden expansion for a pipe flow. [05]